ANNUAL TRANSURANIC WASTE INVENTORY REPORT – 2007

APPENDIX D

Inventory Comparisons

D-1 Introduction

This appendix presents transuranic (TRU) waste inventory comparisons for volumes, waste material parameters, scaling factors, and radionuclide data between the Waste Isolation Pilot Plant (WIPP) Compliance Certification Application (CCA), the Compliance Recertification Application 2004 (CRA) Performance Baseline Calculation (PABC), and this report. The data for the CCA are reported in the Transuranic Waste Baseline Inventory Report (TWBIR), Revision 2 (DOE 1995b), and TWBIR, Revision 3 (DOE 1996a). Data reported for the CRA are from Appendix DATA, Attachment F, of the CRA (DOE 2004) and the TWBIR-2004 DOE (2006c). The TWBIR-2004 is the most recent inventory report prior to this report. The TWBIR-2004 report was prepared to include updated information for EPA's approval of the CRA-2004 and is referred to as the PABC-2004 inventory in this document. This 2007 annual report documents the TRU waste inventory information based on a cutoff date of December 31, 2006. The inventory in this report is referred to as the 2006 Inventory throughout this appendix.

Each TRU generator waste site has provided the WIPP with their best estimates for the volumes, physical characteristics, waste material parameters (WMPs), and radiological characteristics of the individual TRU waste streams that are stored on or projected for their site. Since the TWBIR-2004 was prepared, a number of significant developments have occurred that can change the volume, physical characteristics, or radiological characteristics of TRU waste streams as they were reported by the sites for the 2006 Inventory. These developments include:

- Regulations and decisions at the federal and state level. For example, Idaho National Laboratory (INL) has begun preparations to ship pre-1970 buried waste to the WIPP, as mandated by a federal court decision (Wasden 2003). Shipment of pre-1970 buried waste has increased the volume of stored waste at INL because this type of waste is generally not planned for disposal at the WIPP;

- Waste program management decisions. All waste streams from the Hanford Office of River Protection (RP) and two sodium-bearing waste streams from INL have been re-categorized as potential WIPP waste pending finalization of the U.S. Department of Energy's (DOE's) TRU waste determination process. This change significantly reduced the volume of stored remote-handled (RH) TRU waste in the 2006 Inventory;

- Availability and confidence in supplemental characterization information or process knowledge. For example, waste streams stored at the Los Alamos National Laboratory (LANL) have a significant increase in curies in the 2006 Inventory because of improvements in LANL's methodology for tracking and characterizing TRU waste;

- Site estimates of projected TRU waste stream volumes. Changes in projected waste streams directly affect the contact-handled (CH) and RH waste scaling factors that determine the disposal inventory for performance assessment (PA);

- Continuing waste emplacement at the WIPP. As of December 31, 2006, 44,687 cubic meters (m^3) of waste have been emplaced at the WIPP, reducing the volumes of stored waste at the sites by an equal amount;

- Methodology enhancements. The 2006 Inventory incorporates standardized masses for packaging material for each type of waste container (Crawford 2007). This approach provides a consistent and conservative representation of packaging materials over all waste streams. This approach has increased the masses of cellulosics and plastics in the 2006 Inventory; and

- Enhanced Data Checks. Several data checks were performed on the data collected from the sites to ensure all radionuclides were reported in which, for example, a few mixed fission products were typically reported and radionuclides in secular equilibrium were reported. The results of these checks were discussed with the TRU waste sites and data were changed, as necessary, under the site's direction. In addition, cement data were rechecked and included in the inventory whenever the presence of cement was reported in a comment field for a waste stream.

The WIPP has been open and operating for nearly nine years. The large quantity TRU waste sites are all actively preparing acceptable knowledge (AK) and are characterizing waste for shipment to and emplacement in the WIPP. The characterization data for this emplaced waste are documented in the WIPP Waste Information System (WWIS) database. As time progresses, the data in the WWIS and TRU waste characterization by the sites are used to update the TRU waste inventory and continue to provide a more accurate representation of the expected inventory at closure of the WIPP.

D-2 Volumetric Comparisons

The largest reported volume change occurred at the RP when the DOE Carlsbad Field Office (CBFO) requested that all of the reported TRU waste from the RP tanks be re-categorized as "potential" WIPP-bound waste (Moody 2007b). These waste streams have been removed from the 2006 Inventory for PA and are reported as potential waste in section 4.0 of this report. The final form volume of CH-TRU waste reported by the RP is 1,117 m^3 (RP-W754 and RP-W755) and the RH-TRU waste final form volume is 1,687 m^3 (RP-W013 and RP-W016). These CH and RH volumes are less than the volumes reported for the RP site in the PABC, 3,932 m^3 and 4,469 m^3, respectively. These changes are based on changes to tank waste processing estimates and direct packaging of dried tank waste in RH canisters.

Oak Ridge National Laboratory (ORNL) reported all of their TRU waste as projected waste with a final form volume of 450 m^3 of CH and 660 m^3 of RH for the PABC inventory because all of this waste was going to be treated and re-packaged in their TRU Waste Processing Facility. For the 2006 Inventory, the ORNL waste has been re-categorized as stored and projected waste, where the new final form projected volumes are 340 m^3 of CH and 360 m^3 RH wastes. These changes significantly decreased the volume of projected waste for the 2006 Inventory. In addition, ORNL developed a new scenario for processing Melton Valley and other tank wastes (OR-W215) that increased the RH-TRU final form waste volume for ORNL by 698 m^3 (890 m^3 reported in 2006 vs. 192 m^3 reported in the PABC).

Tables D-1, D-2, D-3, and D-4 show the final form anticipated (stored + projected) volumes of small quantity site CH- and RH-TRU waste, and CH- and RH-TRU waste for large quantity sites with the small quantity site volumes totaled. The tables compare the 2006 Inventory volumes with the volumes reported for the CCA and PABC.

Table D-1. Small Quantity Site CH-TRU Waste Anticipated Volumes

Site	CCA (m^3)	PABC (m^3)	2006 Inventory (m^3)
Ames Laboratory-Iowa State University (AL)	4.2E-01	0.0E+00	0.0E+00
Argonne National Laboratory - East (ANL-E)	1.4E+02	1.9E+02	8.8E+01
Argonne National Laboratory - West (MFC)	7.5E+02	4.4E+01	3.7E+01
Battelle Columbus Laboratories (BC)	0.0E+00	5.2E+00	0.0E+00
Bettis Atomic Power Laboratory (BAPL)	1.2E+02	1.9E+01	1.9E+01
Energy Technology Engineering Center (ETEC)	1.7E+00	2.3E+00	0.0E+00
Knolls Atomic Power Laboratory - NFS (KAPL-NFS)	0.0E+00	2.3E+02	1.3E+02
Lawrence Berkley Laboratory (LBL)	0.0E+00	0.0E+00	4.2E-01
Lawrence Livermore National Laboratory (LLNL)	9.4E+02	2.4E+03	3.8E+02
Mound Plant (MD)	2.7E+02	0.0E+00	0.0E+00
Nevada Test Site (NTS)	6.3E+02	1.1E+03	6.7E+02
Paducah Gaseous Diffusion Plant (PA)	1.9E+00	1.1E+01	0.0E+00
Pantex Plant (PX)	6.2E-01	0.0E+00	0.0E+00
Sandia National Laboratories – Albuquerque (SNL-A)	1.4E+01	2.4E+01	2.9E+01
Teledyne Brown Engineering (TB)	2.1E-01	0.0E+00	0.0E+00
U.S. Army Materiel Command (Army)	2.5E+00	2.5E+00	2.1E-01
University of Missouri Research Reactor (MU)	1.0E+00	1.5E+00	0.0E+00
Total	**2.9E+03**[1]	**4.0E+03**[1]	**1.3E+03**[2]

[1]Volumes may differ with summation of small quantity site volumes because sites that have been dispositioned are not included in the table.
[2]Additional precision is reflected in changed value.

Table D-2. Small Quantity Site RH-TRU Waste Anticipated Volumes

Site	CCA (m^3)	PABC (m^3)	2006 Inventory (m^3)
Argonne National Laboratory - East (ANL-E)	0.0E+00	1.2E+02	4.3E+01
Argonne National Laboratory - West (MFC)	1.3E+03	9.3E+01	4.1E+01
Battelle Columbus Laboratories (BC)	5.8E+02	4.6E+01	0.0E+00
Bettis Atomic Power Laboratory (BAPL)	6.7E+00	2.0E+00	3.6E+00
Energy Technology Engineering Center (ETEC)	8.9E-01	5.0E+00	0.0E+00
Knolls Atomic Power Laboratory-Schenectady (KAPL-S)	0.0E+00	1.4E+02	1.1E+02
Sandia National Laboratories-Albuquerque (SNL-A)	0.0E+00	4.6E+00	2.0E+01
Total	**1.9E+03**[1]	**4.0E+02**[1, 2]	**2.2E+02**

[1]Volumes may differ with summation of small quantity site volumes because sites that have been dispositioned are not included in the table.
[2]Additional precision is reflected in changed value.

Table D-3. WIPP Total CH-TRU Waste Anticipated Volumes by Site

Site	CCA (m^3)	PABC (m^3)	2006 Inventory (m^3)
Hanford Office of River Protection (RP)	0.0E+00	3.9E+03	0.0E+00
Hanford Richland Operations (RL)	4.6E+04	1.8E+04	1.4E+04
Idaho National Laboratory (INL)	2.9E+04	7.8E+04	5.9E+04
Los Alamos National Laboratory (LANL)	1.8E+04	1.5E+04	1.6E+04
Oak Ridge National Laboratory (ORNL)	1.6E+03	4.5E+02	1.0E+03
Rocky Flats Environmental Technology Site (RFETS)	5.1E+03	8.1E+03	0.0E+00
Savannah River Site (SRS)	9.6E+03	1.5E+04	1.1E+04
Total of Small Quantity Sites	2.9E+03	4.0E+03	1.3E+03[2]
Total	**1.1E+05**[1]	**1.4E+05**[1]	**1.0E+05**

[1]Volumes may differ with summation of small quantity site volumes because sites that have been dispositioned are not included in the table.
[2]Additional precision is reflected in changed value.

Table D-4. WIPP Total RH-TRU Waste Anticipated Volumes by Site

Site	CCA (m^3)	PABC (m^3)	2006 Inventory (m^3)
Hanford Office of River Protection (RP)	0.0E+00	4.5E+03	0.0E+00
Hanford Richland Operations (RL)	2.2E+04	1.5E+03	1.3E+03
Idaho National Laboratory (INL)	2.2E+02	2.2E+02	3.7E+02
Los Alamos National Laboratory (LANL)	1.9E+02	1.2E+02[2]	9.8E+01
Oak Ridge National Laboratory (ORNL)	2.9E+03	6.6E+02	1.3E+03
Rocky Flats Environmental Technology Site (RFETS)	0.0E+00	0.0E+00	0.0E+00
Savannah River Site (SRS)	0.0E+00	2.3E+01	7.8E+01
Total of Small Quantity Sites	1.9E+03	4.0E+02[2]	2.2E+02
Total	**2.7E+04**[1]	**7.4E+03**[1]	**3.3E+03**[2]

[1]Volumes may differ with summation of small quantity site volumes because sites that have been dispositioned are not included in the table.
[2]Additional precision is reflected in changed values.

Figures D-1 and D-2 are graphical representations of the volume changes from the CCA, PABC for the CRA-2004, and the 2006 Inventory. In Figure D-1, it is apparent that in most cases, with the exception of BAPL and SNL, the CH-TRU waste inventory has decreased from the volume reported in the PABC. In some cases (such as BCL, ETEC, Mound, and the University of Missouri Research Reactor), all TRU waste has either been dispositioned at the WIPP or transferred to another site to facilitate certification and shipment of the waste to the WIPP. This behavior is consistent with the sites shipping waste to the WIPP, thereby reducing their volume of stored waste.

Figure D-2 shows an increase in ORNL RH-TRU waste volume due to changes in volume expected from processing of Melton Valley and other tank waste mentioned previously. BAPL and SNL also reported increases in RH waste volume in the 2006 Inventory. All other small quantity sites show a decrease due to either transfer of waste to other sites (as is the case for BCL and ETEC) or better understanding of waste volumes being managed at the sites.

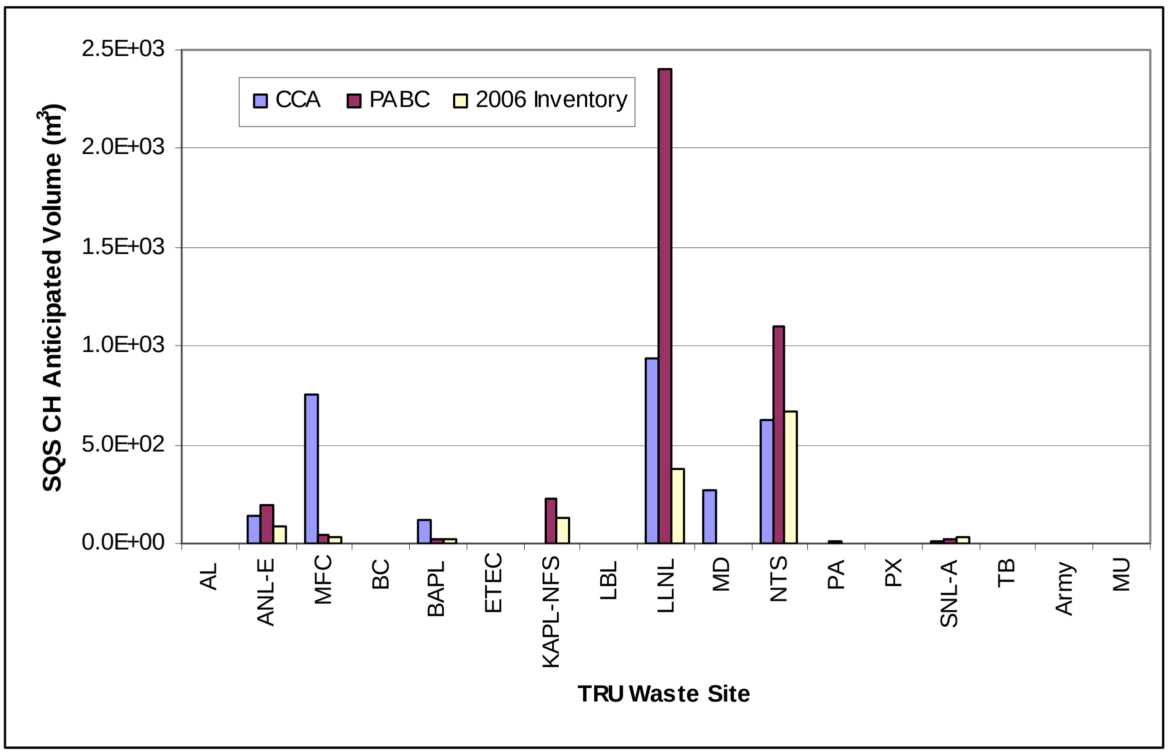

Figure D-1. Small Quantity Site CH-TRU Waste Anticipated Volumes

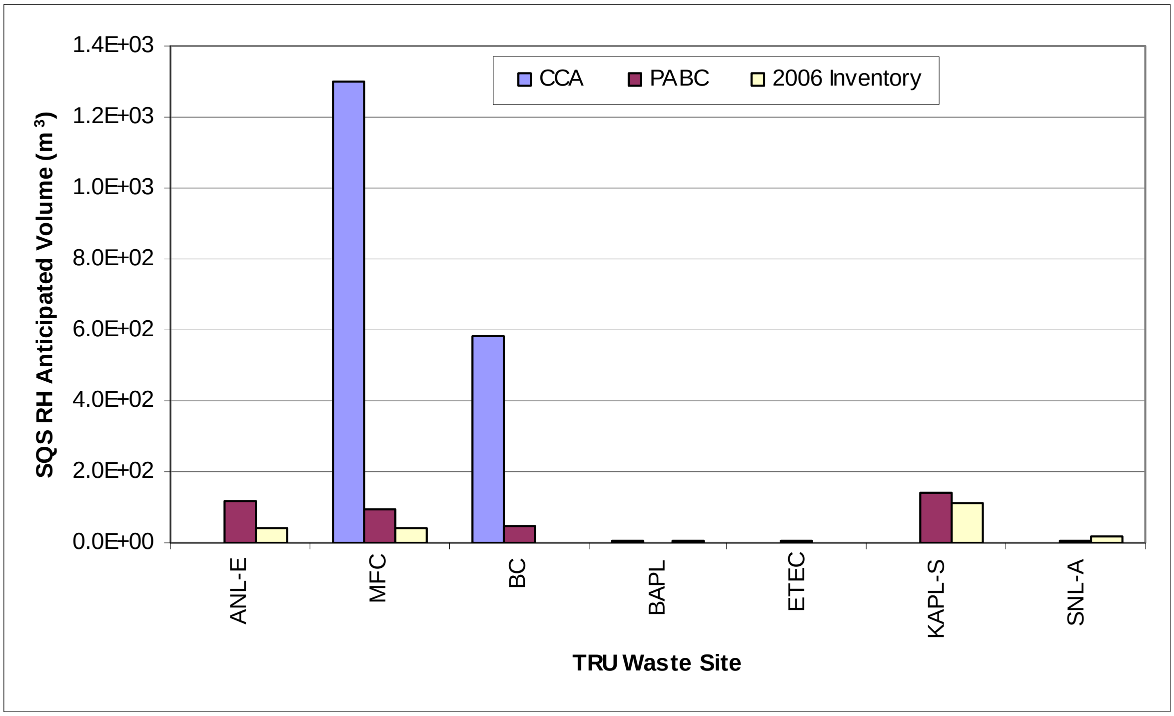

Figure D-2. Small Quantity Site RH-TRU Waste Anticipated Volumes

Figures D-3 and D-4 are graphical representations of the volumes shown in Tables D-3 and D-4. The figures clearly illustrate where volumetric changes have occurred over time. Decreases in site CH-TRU volume are attributable to shipments made to the WIPP and to other DOE TRU waste sites. The estimations of waste volumes at Hanford RL have improved as the site is beginning to locate and characterize waste for shipment to the WIPP. Figure D-4 also shows a decrease in RH-TRU waste volume based on the re-categorization of RP tank waste (1,687 m^3) as potential WIPP waste (Moody 2007b) and a slight increase in waste at INL due to transfer of some waste from MFC to INL.

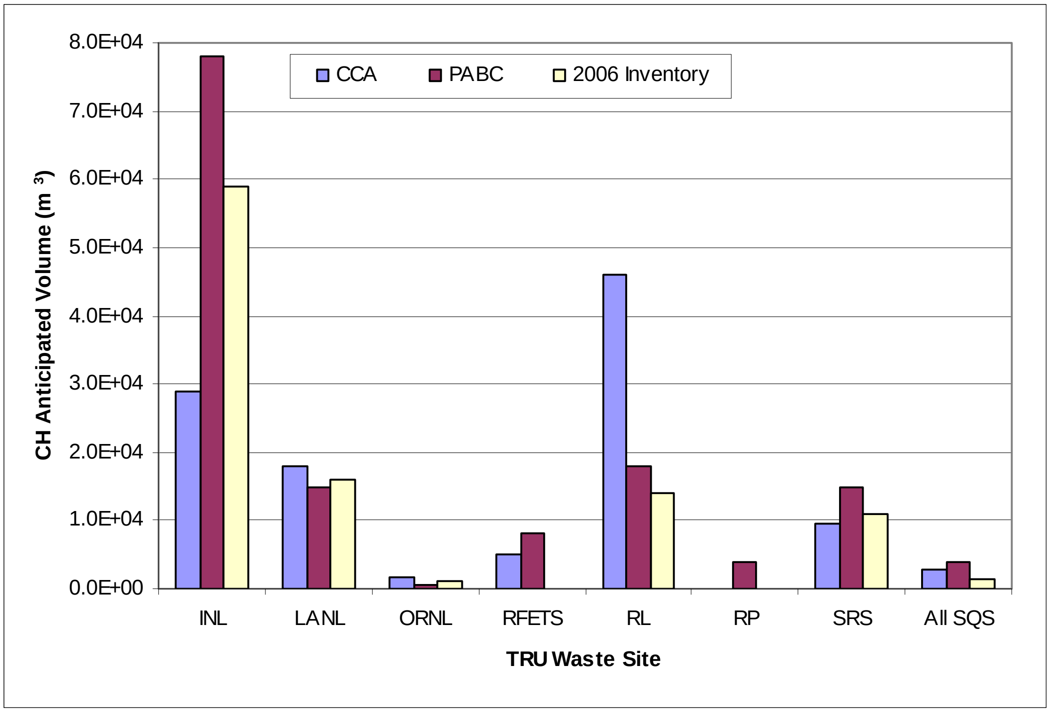

Figure D-3. Total CH-TRU Waste Anticipated Volumes by Site

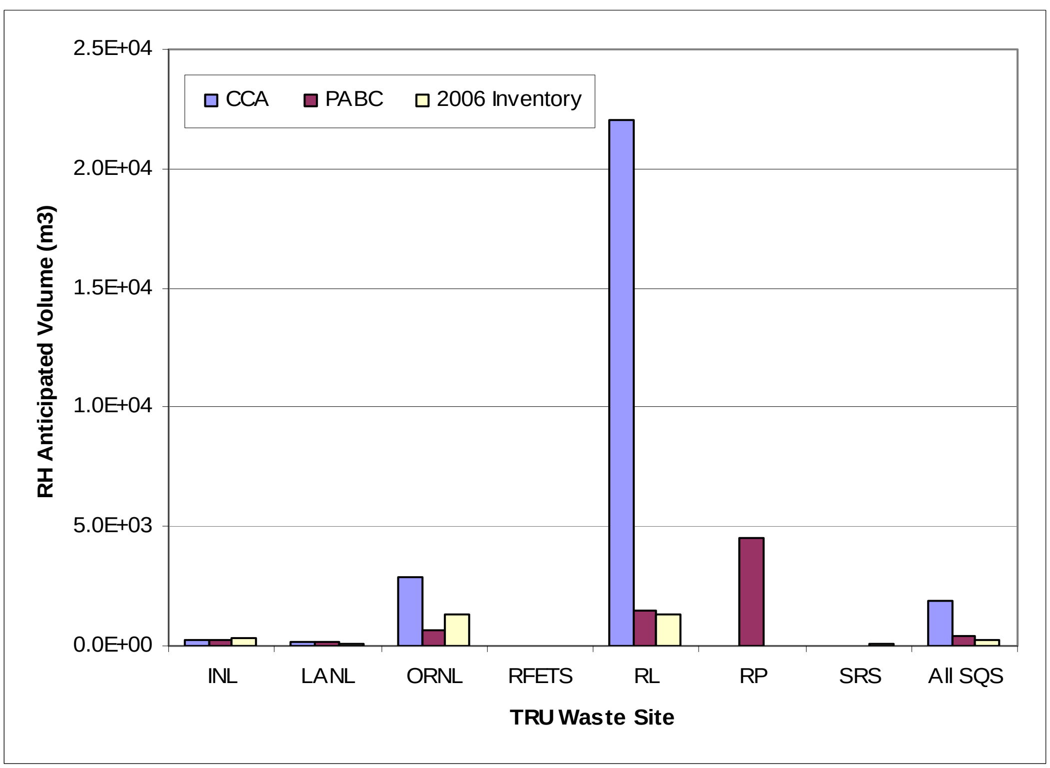

Figure D-4. Total RH-TRU Waste Anticipated Volumes by Site

D-3 Waste Material Parameter Comparisons

Changes have occurred in the waste material parameters (WMPs) for several reasons:

1) Additional waste streams added to the inventory. For example INL and SRS added waste streams while AK was developed on site that includes waste parameters that match the waste as it is being characterized. Examples of new waste streams added to inventory are LA-LAMHD01 (constructed from containers from TWBIR waste streams LA-T004, LA-T005, LA-T009, LA-W001, LA-W004, LA-W005, and LA-W009) and LA-LAMHD03 (constructed from containers from TWBIR waste streams LA-T004, LA-T005, LA-T007, LA-T009, LA-W004, and LA-W005). Typically, when waste is assigned to these waste streams, the waste material parameters are refined without changes to the volume of the containers managed at the site.
2) Presence of more characterization data. This means as more characterization data real-time radiography (RTR) or visual examination (VE) become available at the sites (SRS being a site with approximately 80% of their TRU waste in drums characterized, as an example), the information reported includes that characterization data in the estimate. Therefore, a better estimate of the WMPs is reported each year.
3) Removal of waste from the 2006 Inventory as other disposition paths is found. As an example, Hanford RL and ORNL both dispositioned nearly 50% of the TRU waste streams managed on-site as low-level waste (LLW) or mixed low-level waste (MLLW) and adjusted their inventory accordingly. Other sites typically identify some fraction of their waste as LLW/MLLW after characterization. Disposition of waste streams as LLW/MLLW removes waste from the TRU inventory, changing the WMPs for the waste stream.
4) The 2006 Inventory has standardized container material densities across the waste streams.

Tables D-5 and D-6 show the WMPs for CH- and RH-TRU waste, respectively. The waste and packaging material parameters are reported directly from the CCA, PABC, and the 2006 Inventory.

Table D-5. CH-TRU Average Waste Material and Packaging Parameters

Waste Material Parameters	CCA (kg/m^3)	PABC (kg/m^3)	2006 Inventory (kg/m^3)
Iron-Based Metal/Alloys	1.7E+02	1.1E+02	1.8E+02
Aluminum-Based Metal/Alloys	1.8E+01	1.4E+01	1.5E+01
Other Metal/Alloys	6.7E+01	3.2E+01	1.1E+01
Other Inorganic Materials	3.1E+01	4.0E+01	3.4E+01
Vitrified	5.5E+01	5.8E+00	0.0E+00
Cellulosics	5.4E+01	6.0E+01	7.3E+01
Rubber	1.0E+01	1.3E+01	6.6E+00
Plastics	3.4E+01	4.3E+01	8.2E+01
Solidified Inorganic Material	5.4E+01	1.1E+02	1.1E+02
Solidified Organic Material	5.6E+00	3.3E+01	4.6E+01
Cements	5.0E+01	3.9E+01	6.8E+01
Soils/Gravels	4.4E+01	1.1E+02	9.1E+00
Packaging Materials			
Steel	1.4E+02	1.7E+02	1.8E+02
Plastic	2.6E+01	1.7E+01	1.9E+01
Lead	0.0E+00	1.3E-02	0.0E+00
Cellulosics	0.0E+00	0.0E+00	4.7E+00

Table D-6. RH-TRU Average Waste Material and Packaging Parameters

Waste Material Parameters	CCA (kg/m^3)	PABC (kg/m^3)	2006 Inventory (kg/m^3)
Iron-Based Metal/Alloys	1.0E+02	5.9E+01	1.9E+02
Aluminum-Based Metal/Alloys	7.1E+00	5.0E+00	1.0E+01
Other Metal/Alloys	2.5E+02	5.7E+01	4.5E+01
Other Inorganic Materials	6.4E+01	1.6E+01	2.3E+01
Vitrified	4.7E+00	1.2E-01	7.2E-02
Cellulosics	1.7E+01	9.3E+00	1.4E+01
Rubber	3.3E+00	6.7E+00	4.7E+00
Plastics	1.5E+01	8.0E+00	1.8E+01
Solidified Inorganic Material	2.2E+01	6.2E+01	5.9E+02
Solidified Organic Material	9.3E-01	8.3E-01	7.1E-01
Cements	1.9E+01	1.9E+00	1.2E+01
Soils/Gravel	1.0E+00	5.0E+01	7.7E+01
Packaging Materials			
Steel	4.5E+02	5.4E+02	6.1E+02
Steel Plug	2.2E+03	0.0E+00	0.0E+00
Plastic	3.1E+00	3.1E+00	1.1E+01
Lead	4.7E+02	4.2E+02	5.4E+00
Cellulosics	0.0E+00	0.0E+00	0.0E+00

Figure D-5 is a graphical representation of the changes that have occurred in waste material parameters since the CCA, for the CH-TRU waste inventory. The 2006 Inventory shows a marked increase in iron-based metal/alloys and plastic for CH-TRU waste. The increase in iron-based metal is inconsequential for PA because the repository exceeds the lower limit of iron required for compliant repository performance with the steel from containers alone (DOE 2004c). In other words, the lower limit for iron-based materials is already exceeded, and any further increase in the mass of iron-based materials has no significant impact on repository performance.

Cellulose, plastic and rubber are tracked because these waste materials and packaging materials contribute to gas generation in the repository. Increases observed in waste material densities for plastic and cellulosics were partially offset by a decrease in rubber. Plastic material density increased by 91 percent, while cellulose increased by 22 percent as determined by the difference of the PABC density from the 2006 density divided by the PABC density multiplied by 100. The decrease in rubber was 49 percent. The increase in plastic waste materials at SRS was most pronounced based on underestimation of the presence of plastic huts in the reported waste streams at the site. In addition, increases in both plastic and cellulose were observed as the packaging materials for the inventory were standardized for WIPP-approved container configurations.

Other notable changes in CH-TRU waste material parameters include increased cement content and a decrease in soils/gravel. Using the same algorithm stated above, the increase in cement density was 74 percent and the decrease in soils/gravel was 92 percent with respect to the densities reported in the PABC. The cement density increased as a result of a concerted focus on obtaining this information as part of the waste material parameters for all waste streams and all sites. In the PABC, cement content was reported in various comments and as other inorganic material, if reported at all. The decrease in density of soils/gravel is primarily due to better characterization data from projects such as the Idaho Closure Project (ICP), where previous inventories assumed larger amounts of soils would be present in the CH-TRU waste being retrieved at INL.

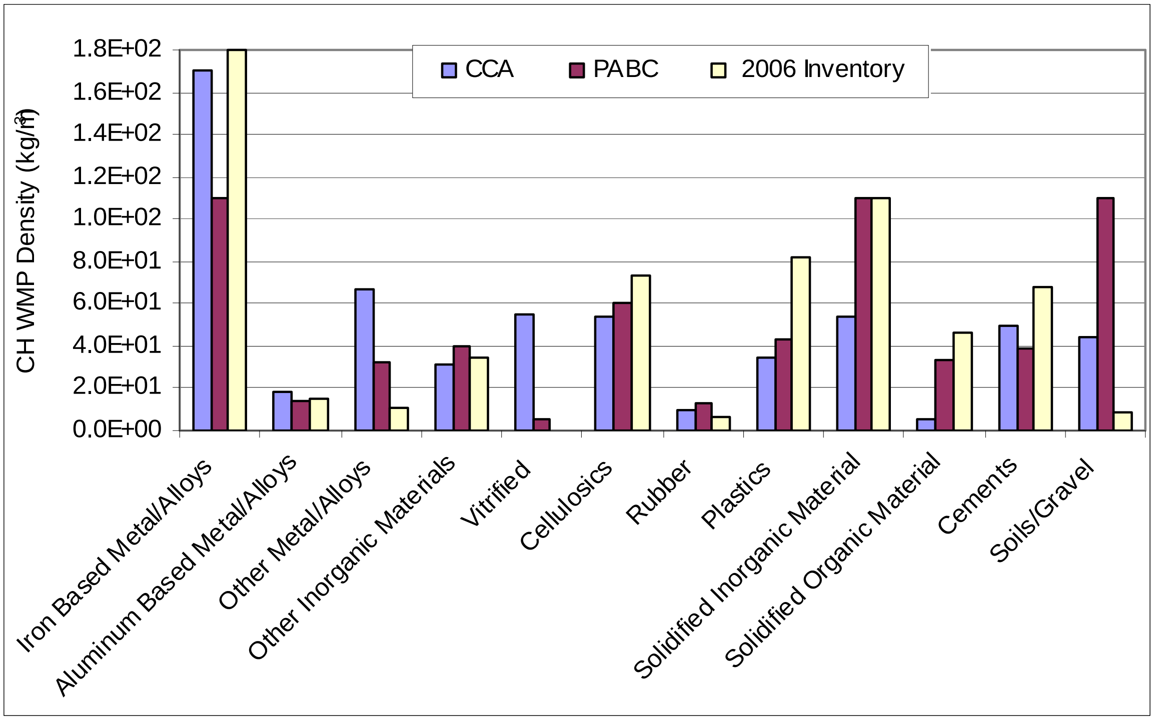

Figure D-5. CH-TRU Waste Material Parameters

Figure D-6 is a graphical representation of the changes that have occurred in waste material parameters from the CCA through the 2006 Inventory, for the RH-TRU waste. The increase in the solidified inorganic material comes from the increase in ORNL tank sludge (OR-W215) and Hanford uncontained solids from K-East (RL105-09) based on process knowledge obtained in 2006 (LANL 2008). The increase in iron-based metal/alloys is inconsequential for the same reason described for CH-TRU waste.

Cellulose and plastics increased by 51 percent and 125 percent, respectively, while rubber decreased by 30 percent in the RH-TRU waste inventory, using the algorithm stated above. The increase in cellulose was due to debris and filter waste at SRS and the increase in plastic was the result of liners identified as standard packaging material in drums packed in RH canisters. Other notable increases in the RH-TRU waste inventory include an increase of 229 percent for iron-based metal/alloys and an 851 percent increase for solidified inorganic material. The iron-based metal increased in waste streams from K-basin and the 300 areas at Hanford RL and from associated container packaging in those waste streams. The pronounced change in solidified inorganic material was the result of addition of North Load Out Pit sludge from K-basin at Hanford RL and from re-categorizing vitrified waste identified in the IN-W219.110 waste stream at INL to solidified inorganic material, as vitrification was not performed on site.

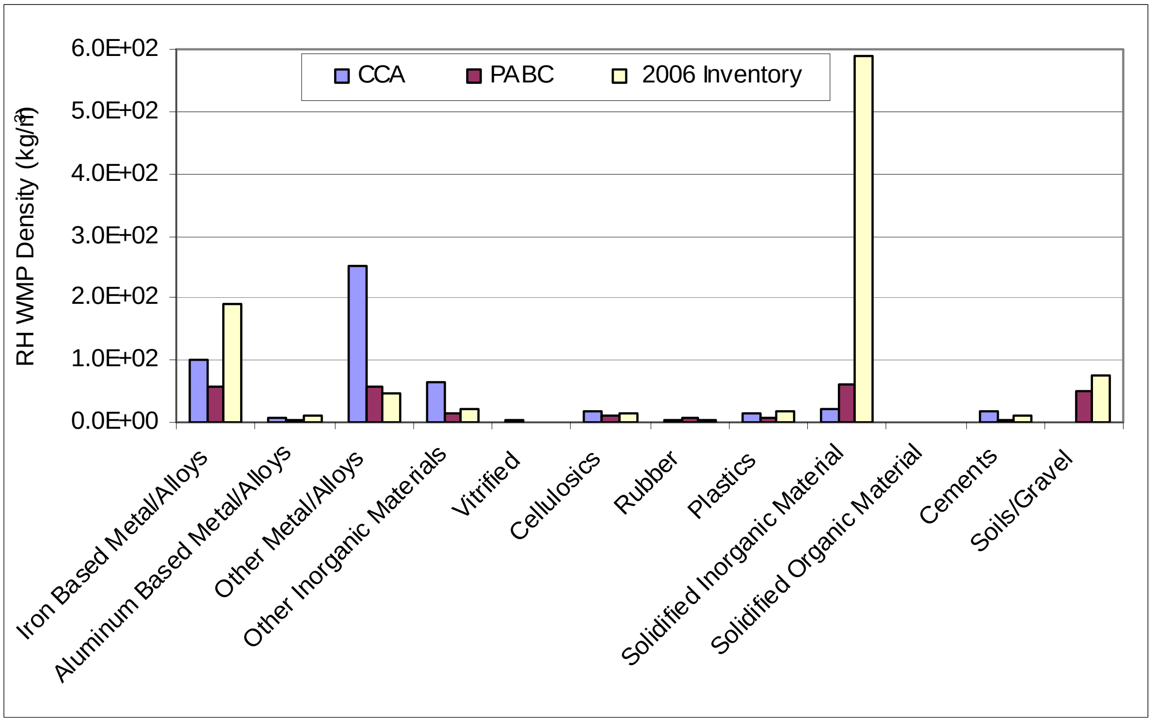

Figure D-6. RH-TRU Waste Material Parameters

D-4 Scaling Factor Comparisons

The current CH and RH scaling factors are applied to the projected components of the waste to determine the disposal inventory. The scaling factors for CH- and RH-TRU wastes are larger now as compared to the CCA or CRA-2004, particularly for the RH waste. A large volume of RH waste from the RP has been re-categorized from the projected category to potential WIPP-bound waste, thereby reducing the volume of projected waste and increasing the corresponding scaling factor. The detailed method used for determination of the scaling factor is presented in section 2.2.1 of this report, Volume and Scaling Calculations.

Table D-7 shows how the scaling factors have changed as reported in the CCA, PABC, and the 2006 Inventory. The scaling factor for CH-TRU waste in the 2006 Inventory has increased significantly because of a decrease in the projected component of the inventory. The scaling factor for RH-TRU waste reported in the 2006 Inventory has also increased significantly because of a decrease in the volumes of both stored and projected RH-TRU waste at the sites. All scaling factors assume a full repository, where the CH- and RH-TRU waste volumes are 168,485 and 7,079 m^3, respectively.

Table D-7. CH and RH Scaling Factors Used to Generate Disposal Inventory

	CCA	PABC	2006 Inventory
CH-TRU Waste Scaling Factor	2.05	1.48	7.74
RH-TRU Waste Scaling Factor	NA[1]	0.861	6.56

[1]RH-TRU waste scaling factor was not applied to RH-TRU waste in the CCA.

D-5 Total Unscaled Curies Radionuclide Comparisons

Radionuclide total unscaled curie comparisons are presented by site in Tables D-8 and D-9 for CH- and RH-TRU waste, respectively. The unscaled curies in these tables include curie activity from all TRU waste (emplaced, stored, and projected) for a given site. Additional characterization data since the PABC led to better information for the 2006 Inventory. The increase in CH-TRU unscaled curies between CRA-2004 (shown in the table as PABC) and the 2006 Inventory is due to increases at LANL, SRS, and RFETS. Both CH- and RH-TRU waste streams at LANL had increased in CH-TRU curies because of changes in the methodology used for tracking and characterization of TRU waste. The TRU waste inventory at LANL has been tied directly to the site container database. This database includes characterization data on radionuclides and AK information about waste material parameters. Both CH- and RH-TRU waste streams at SRS had a significant increased in total curies after receiving waste from BCL. RFETS data shown in these tables come from WWIS data for emplaced waste and show increased activity over that reported for the PABC. Finally, RH-TRU waste streams at Hanford RL, INL, and the small quantity sites have increased in activity. The increase in RH waste activity at Hanford RL is from increased Cs-137 and Sr-90 reported for the Waste Treatment Plant debris waste stream and Pu-241 reported in K-basin sludge. The increase in RH-TRU activity from INL is from increased Cs-137, Sr-90 and Pu-241 reported for the waste originating from the Alpha Gamma Hot Cells and is based on new AK information. Slight increases in RH-TRU activity have been noted for small quantity sites where data checks were performed and discussed with the sites on a case-by-case basis and radionuclides were revised accordingly.

The total activity for CH-TRU waste at small quantity sites, as shown in Tables D-8 and D-10, has diminished since the PABC inventory because of disposal of their waste in the WIPP and because waste has been moved to other DOE TRU waste sites for characterization. Figures D-7 and D-8 graphically depict the data in Tables D-8 and D-9.

Table D-8. Contact Handled Unscaled Curies by Site

Site[1]	CCA[2] (Ci)	PABC[3] (Ci)	2006 Inventory[4] (Ci)
Los Alamos National Laboratory (LANL)	2.03E+05	1.10E+05	7.23E+05
Hanford Richland Operations (RL)	1.62E+05	1.17E+06	5.11E+05
Hanford Office of River Protection (RP)	--	1.13E+05	--
Savannah River Site (SRS)	5.65E+05	1.33E+06	2.21E+06
Rocky Flats Environmental Technology Site (RFETS)	1.16E+06	8.70E+05	1.02E+06
Idaho National Laboratory (INL)	3.51E+05	5.85E+05	4.83E+05
Oak Ridge National Laboratory (ORNL)	6.38E+04	6.68E+04	5.00E+04
Total of Small Quantity Sites (SQS)	8.01E+03	6.22E+04	9.20E+04
Grand Totals	**2.51E+06**	**4.30E+06**	**5.09E+06**

[1]Only considers WIPP-bound waste.
[2]Decayed through 1995; [3]Decayed through 2001, value reflects emplaced activity not addressed in Revision 0;
[4]Decayed through 2006.

Table D-9. Remote Handled Unscaled Curies by Site

Site[1]	CCA[2] (Ci)	PABC[3] (Ci)	2006 Inventory[4] (Ci)
Los Alamos National Laboratory (LANL)	6.30E+02	6.38E+01	6.21E+03
Hanford Richland Operations (RL)	3.23E+04	1.01E+06	1.60E+06
Hanford Office of River Protection (RP)	0.00E+00	4.27E+05	0.00E+00
Savannah River Site (SRS)	4.20E+01	3.50E+02	7.44E+03
Rocky Flats Environmental Technology Site (RFETS)	--	--	--
Idaho National Laboratory (INL)	7.39E+03	3.26E+03	1.52E+04
Oak Ridge National Laboratory (ORNL)	9.81E+04	1.48E+05	5.08E+05
Total of Small Quantity Sites (SQS)	5.78E+02	8.85E+04	9.74E+04
Grand Totals	**1.39E+05**	**1.68E+06**	**2.24E+06**

[1]Only considers WIPP-bound waste.
[2]Decayed through 1995.
[3]Decayed through 2001, value reflects emplaced activity not addressed in Revision 0.
[4]Decayed through 2006.

Table D-10. 2006 Small Quantity Site Unscaled Curie Inventory

Site[1]	Total CH Curies[2]	Total RH Curies[2]
Argonne National Laboratory East (ANLE)	7.36E+02	6.97E+01
Argonne National Laboratory West (MFC)	2.48E+02	4.08E+04
Bettis Atomic Power Laboratory (BAPL)	8.49E+01	4.86E+04
Knolls Atomic Power Laboratory-NFS (KAPL-NFS)	3.00E+02	--
Knolls Atomic Power Laboratory-Schenectady (KAPL-S)	--	3.18E+02
Lawrence Berkley Laboratory (LBL)	2.72E-02	--
Lawrence Livermore National Laboratory (LLNL)	8.54E+04	--
Nevada Test Site (NTS)	4.94E+03	--
Sandia National Laboratories – Albuquerque (SNL-A	3.09E+02	7.62E+03
U.S. Army Materiel Command (Army)	5.13E-03	--
Grand Totals	**9.20E+04**	**9.74E+04**

[1]Only considers WIPP-bound waste.
[2]Decayed through 2006.

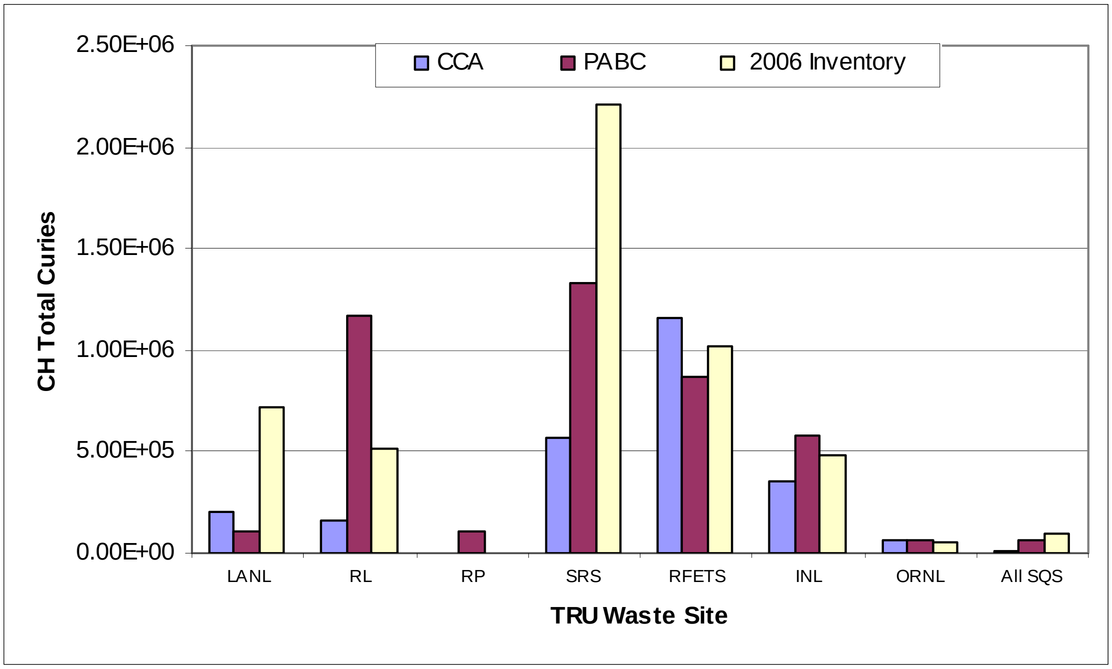

Figure D-7. Comparison of Contact Handled Unscaled Curie Inventory by Site

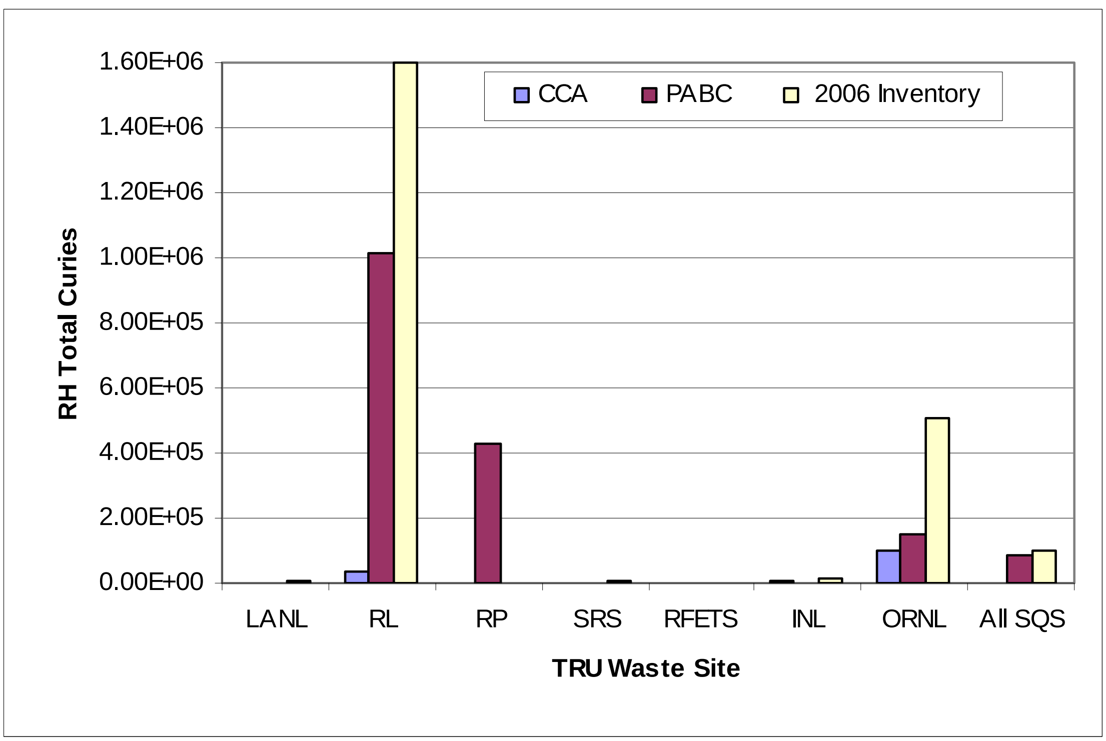

Figure D-8. Comparison of Remote Handled Unscaled Curie Inventory by Site

Tables D-11 and D-12 compare the highest radionuclide disposal activity concentrations of the 2006 Inventory to the CCA and the PABC for CH- and RH-TRU radionuclides, respectively. The data presented in the table are presented graphically in Figures D-9 and D-10 for CH- and RH-TRU radionuclides, respectively. Generally, the radionuclide activity concentration for the majority of the radionuclides reported in the 2006 Inventory is higher than in the CCA and PABC due to a concerted effort to obtain more information on radionuclides for the 2006 Inventory by performing data checks on radionuclides reported by the sites.

Table D-11. Comparison of CH-TRU Highest Radionuclide Disposal Activity Concentrations for the 2006 Inventory to CCA and PABC Radionuclides

Radionuclide	CCA[1] (Ci/m^3)	PABC[2] (Ci/m^3)	2006 Inventory[3] (Ci/m^3)
Am-241	2.62E+00	2.82E+00	2.76E+00
Ba-137m	4.53E-02	4.11E-02	4.50E-02
Cm-244	1.87E-01	3.66E-02	4.53E-02
Cs-137	4.78E-02	4.38E-02	4.84E-02
Eu-154	6.80E-06	9.38E-06	1.91E+00
Eu-155	5.62E-06	2.88E-07	1.29E+01
Pu-238	1.55E+01	8.60E+00	1.26E+01
Pu-239	4.66E+00	3.43E+00	3.19E+00
Pu-240	1.25E+00	5.59E-01	7.79E-01
Pu-241	1.37E+01	1.16E+01	1.13E+01

[1]Decayed through 1995.
[2]Decayed through 2001, additional precision is reflected in value.
[3]Decayed through 2006.

Table D-12. Comparison of RH-TRU Highest Radionuclide Disposal Activity Concentrations for the 2006 Inventory to CCA and PABC Radionuclides

Radionuclide	CCA[1] (Ci/m^3)	PABC[2] (Ci/m^3)	2006 Inventory[3] (Ci/m^3)
Am-241	8.42E-01	1.95E+00	3.94E+00
Ba-137m	2.89E+01	5.56E+01	5.26E+01
Cm-244	4.45E-02	1.54E-01	1.23E+00
Cs-137	3.05E+01	6.02E+01	4.79E+02
Eu-152	1.73E-01	3.34E-01	3.20E+00
Pu-238	2.05E-01	5.38E-01	1.32E+00
Pu-239	1.45E+00	7.41E-01	1.10E+00
Pu-241	2.00E+01	1.84E+01	3.23E+01
Sr-90	2.95E+01	4.55E+01	3.78E+02
Y-90	2.95E+01	4.48E+01	7.84E+01

[1]Decayed through 1995.
[2]Decayed through 2001, additional precision is reflected in value.
[3]Decayed through 2006.

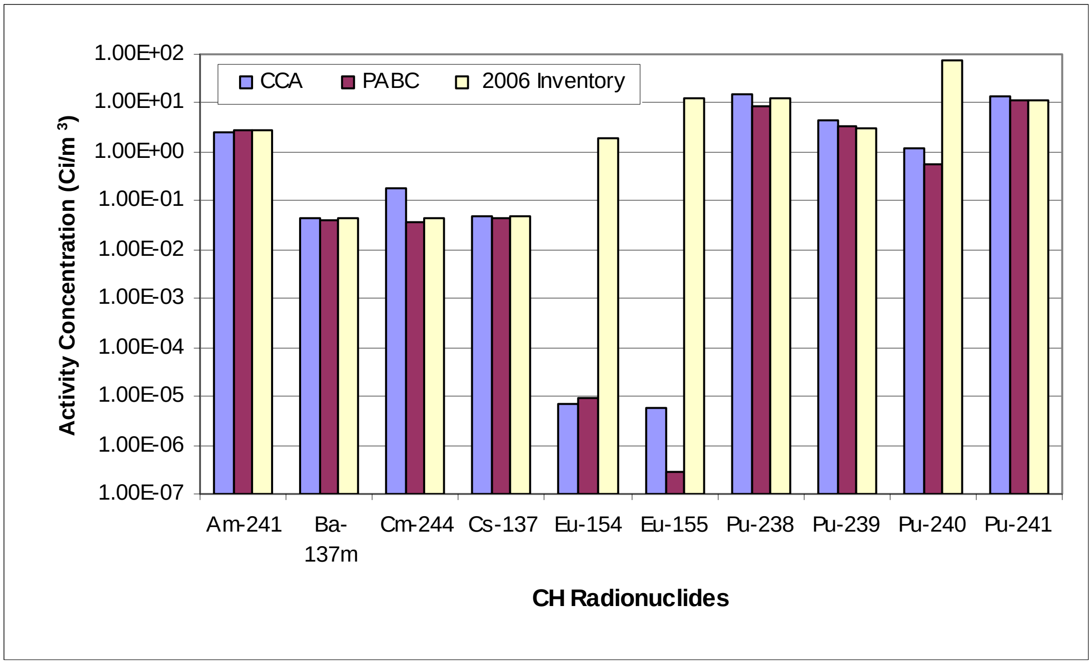

Figure D-9. Comparison of CH-TRU Highest Radionuclide Disposal Activity Concentrations for the 2006 Inventory to CCA and PABC Radionuclides

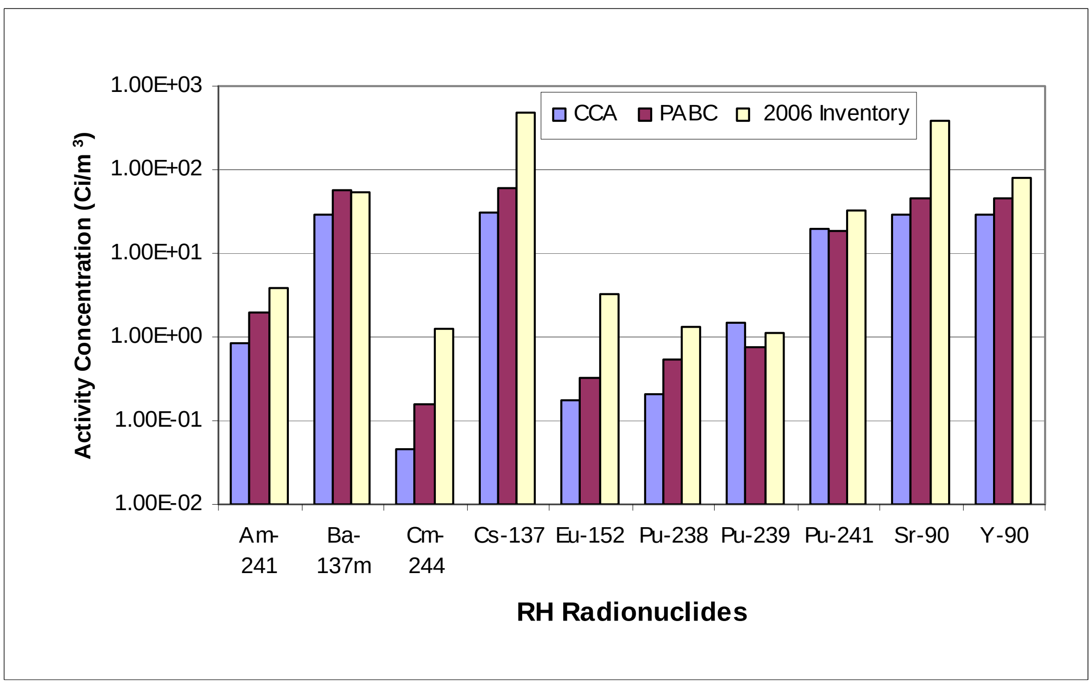

Figure D-10. Comparison of RH-TRU Highest Radionuclide Disposal Activity Concentrations (Ci/m³) for the 2006 Inventory to CCA and PABC Radionuclides

Table D-13 presents a comparison of the total unscaled activity (CH and RH) of 29 PA radionuclides decayed through 2033, the closure year of the WIPP. The data for the CCA and PABC are obtained from Table 14 of Leigh, et al. (2005a). Eight radionuclides with 1000 Ci or greater increases since the PABC are Am-241, Cs-137, Pu-238, Pu-239, Pu-240, Pu-241, Pu-244, and Sr-90. The increases in Am-241 come primarily from the Rocky Flats and Idaho CH waste streams and the Hanford RL 325 RH laboratory waste stream. The Pu isotopes come from LANL Technical Area 55 operations, Pu-238 comes from SRS W027 waste streams, and the Cs137/Sr-90 primarily comes from the treatment of RH waste at the Hanford RL Waste Treatment Plant.

Table D-13. Comparison of the Unscaled Activity of 29 PA Radionuclides Decayed through 2033 WIPP Closure

Radionuclide	CCA (Ci)	PABC (Ci)	2006 Inventory (Ci)[1]
Ac-227	5.05E-01	6.86E-01	1.84E+01
Am-241	4.88E+05	5.17E+05	4.39E+05
Am-243	3.25E+01	7.87E+01	6.75E+01
C-14	1.28E+01	2.41E+00	3.81E+00
Cm-243	2.07E+01	4.14E-01	4.99E+01
Cm-244	7.44E+03	2.13E+03	2.58E+03
Cm-245	1.15E-02	1.71E-02	6.62E-01
Cm-248	3.72E-02	7.43E-02	4.88E-02
Cs-137	9.31E+04	2.07E+05	4.00E+05
Np-237	6.49E+01	1.22E+01	2.56E+01
Pa-231	4.67E-01	8.69E-01	3.98E-01
Pb-210	8.75E+00	3.59E+00	1.53E+00
Pu-238	1.94E+06	1.13E+06	1.20E+06
Pu-239	7.95E+05	5.82E+05	4.78E+05
Pu-240	2.14E+05	9.54E+04	1.13E+05
Pu-241	3.94E+05	4.48E+05	4.91E+05
Pu-242	1.17E+03	1.27E+01	3.96E+01
Pu-244	1.51E-06	5.53E-03	3.03E-04
Ra-226	1.14E+01	4.56E+00	1.89E+00
Sr-90	8.73E+04	1.76E+05	3.39E+05
Th-229	9.97E+00	5.21E+00	9.38E+00
Th-230	3.06E-01	1.80E-01	2.04E-01
Th-232	1.01E+00	3.42E+00	4.98E+00
U-232	1.79E+01	1.02E+01	2.91E+01
U-233	1.95E+03	1.23E+03	1.06E+03
U-234	7.51E+02	3.44E+02	2.92E+02
U-235	1.75E+01	5.01E+00	1.01E+01
U-236	6.72E-01	2.87E+00	1.53E+00
U-238	5.01E+01	2.17E+02	1.14E+02

[1]Data Source: CID Data Version D.6.06_0Y.

Table D-14 lists the TRU alpha radionuclides, their respective atomic numbers, and their associated half-lives. A TRU radionuclide, as defined by the LWA (U.S. Congress 1992), is an alpha-emitting radionuclide with an atomic number greater than 92 and half-life greater than 20 years.

Table D-14. TRU Alpha Radionuclides

TRU Radionuclide	Atomic Number	Alpha Emitter	Half-Life (Years)		TRU Radionuclide	Atomic Number	Alpha Emitter	Half-Life (Years)
Am-241	95	Yes	4.32E+02		Cm-247	96	Yes	1.56E+07
Am-242m	95	Yes	1.52E+02		Cm-248	96	Yes	3.39E+05
Am-243	95	Yes	7.38E+03		Cm-250	96	Yes	6.90E+03
Bk-247	97	Yes	1.38E+03		Np-237	93	Yes	2.14E+06
Cf-249	98	Yes	3.51E+02		Pu-238	94	Yes	8.78E+01
Cf-251	98	Yes	9.00E+02		Pu-239	94	Yes	2.41E+04
Cm-243	96	Yes	2.85E+01		Pu-240	94	Yes	6.57E+03
Cm-245	96	Yes	8.50E+03		Pu-242	94	Yes	3.76E+03
Cm-246	96	Yes	4.75E+03		Pu-244	94	Yes	8.26E+07

The sites reported 17 of the 18 TRU alpha radionuclides listed in Table D-14 for the 2006 Inventory (LANL 2008). The sites with the highest total unscaled TRU alpha activity are Hanford RL, INL, LANL, and ORNL (RFETS is entirely emplaced in the WIPP and also showed some increased activity). Table D-15 gives the sum of all TRU alpha radionuclides by site. Figure D-11 is a graphical representation of the total TRU alpha curies at each of the sites for both CH- and RH-TRU waste.

Table D-15. 2006 Unscaled CH- and RH-TRU Alpha Radionuclides Curies by Site

Site[1]	CH Activity[2] (Ci)	RH Activity[2] (Ci)	Total Activity[2] (Ci)
Argonne National Laboratory - East (ANL-E)	5.22E+02	1.45E+01	5.37E+02
Argonne National Laboratory - West (MFC)	1.99E+02	2.39E+01	2.23E+02
U.S. Army Materiel Command (Army)	5.09E-03	--	5.09E-03
Bettis Atomic Power Laboratory (BAPL)	9.27E-01	2.94E+02	2.94E+02
Hanford Richland Operations (RL)	2.13E+05	2.00E+04	2.33E+05
Idaho National Laboratory (INL)	3.58E+05	7.57E+03	3.66E+05
Knolls Atomic Power Laboratory - NFS (KAPL-NFS)	1.71E+02	--	1.71E+02
Knolls Atomic Power Laboratory-Schenectady (KAPL-S)	--	3.25E+00	3.25E+00
Los Alamos National Laboratory (LANL)	3.63E+05	2.51E+02	3.63E+05
Lawrence Berkley Laboratory (LBL)	1.99E-02	--	1.99E-02
Lawrence Livermore National Laboratory (LLNL)	7.89E+03	--	7.89E+03
Nevada Test Site (NTS)	2.51E+03	--	2.51E+03
Oak Ridge National Laboratory (ORNL)	8.11E+03	3.64E+03	1.18E+04
Rocky Flats Environmental Technology Site (RFETS)	4.06E+05	--	4.06E+05
Sandia National Laboratories-Albuquerque (SNL-A)	2.08E+01	1.22E+02	1.43E+02
Savannah River Site (SRS)	1.10E+06	1.69E+02	1.10E+06
Totals	**2.46E+06**	**3.21E+04**	**2.49E+06**

[1]Only considers WIPP-bound waste.
[2]Decayed through 2006.

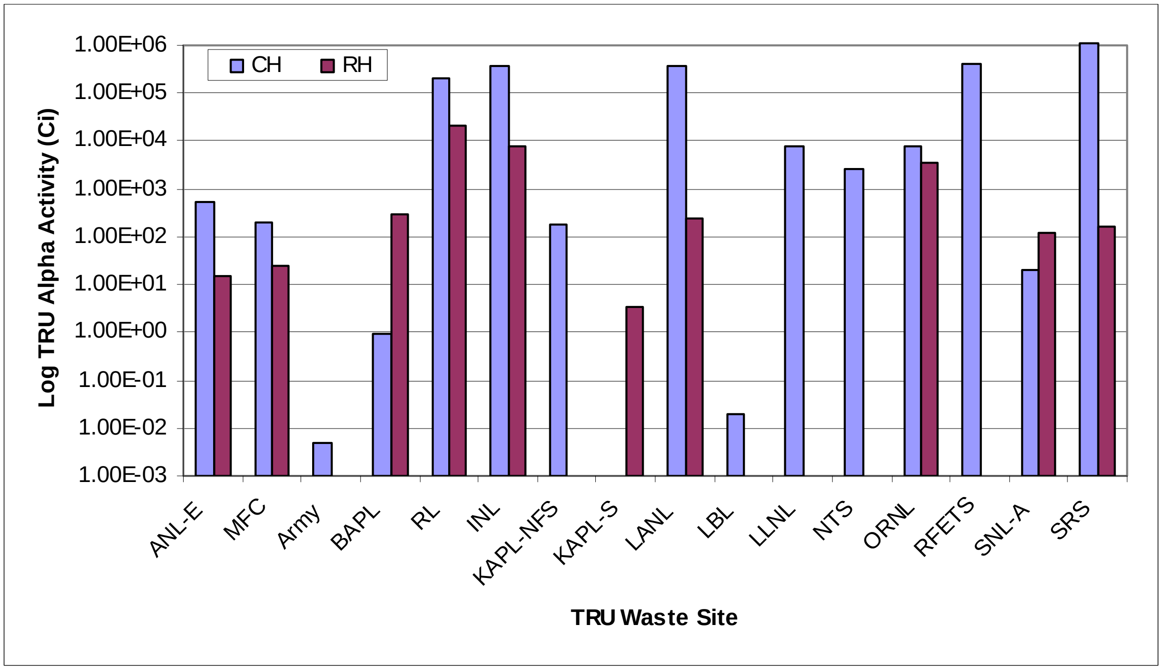

Figure D-11. 2006 Unscaled CH- and RH-TRU Alpha Radionuclides Curies by Site

Tables D-16 and D-17 compare the unscaled TRU alpha radionuclide activities of the 2006 Inventory to the CCA and the PABC. The data presented in the tables are presented graphically in Figures D-12 and D-13 for CH- and RH-TRU radionuclides, respectively. The CH- and RH-TRU alpha curies are higher for LANL because of new characterization data and restructuring of database information. Increases in total TRU curies at Hanford RL are due to the use of production (characterization) data. The RFETS waste streams have increased CH-TRU curies, based on the waste characterization data reported in WWIS. All of the RFETS CH-TRU waste has been emplaced at the WIPP.

Table D-16. Unscaled CH-TRU Alpha Radionuclide Curie Comparisons

Site[1]	CCA[2] (Ci)	PABC[3] (Ci)	2006 Inventory[4] (Ci)
Los Alamos National Laboratory (LANL)	2.02E+05	1.07E+05	3.63E+05
Hanford Richland Operations (RL)	1.18E+05	2.00E+05	2.13E+05
Hanford Office of River Protection (RP)	--	4.06E+03	--
Savannah River Site (SRS)	5.02E+05	1.23E+06	1.10E+06
Rocky Flats Environmental Technology Site (RFETS)	3.82E+05	3.69E+05	4.06E+05
Idaho National Laboratory (INL)	2.00E+05	4.39E+05	3.58E+05
Oak Ridge National Laboratory (ORNL)	7.08E+03	1.04E+04	8.11E+03
All SQS	5.93E+03	1.39E+04	1.13E+04
Total	**1.42E+06**	**2.37E+06**	**2.46E+06**

[1]Only considers WIPP-bound waste.
[2]Decayed through 1995.
[3]Decayed through 2001, value reflects emplaced activity not addressed in Revision 0.
[4]Decayed through 2006.

Table D-17. Unscaled RH-TRU Alpha Radionuclide Curie Comparisons

Site[1]	CCA[2] (Ci)	PABC[3] (Ci)	2006 Inventory[4] (Ci)
Los Alamos National Laboratory (LANL)	9.67E+01	2.59E+00	2.51E+02
Hanford Richland Operations (RL)	7.42E+02	3.92E+03	2.00E+04
Hanford Office of River Protection (RP)	--	1.66E+04	--
Savannah River Site (SRS)	8.91E+00	5.86E+01	1.69E+02
Rocky Flats Environmental Technology Site (RFETS)	--	--	--
Idaho National Laboratory (INL)	1.49E+02	2.80E+03	7.57E+03
Oak Ridge National Laboratory (ORNL)	5.25E+02	7.44E+02	3.64E+03
All SQS	2.49E+01	6.09E+02	4.57E+02
Total	**1.55E+03**	**2.48E+04**	**3.21E+04**

[1]Only considers WIPP-bound waste.
[2]Decayed through 1995.
[3]Decayed through 2001, value reflects emplaced activity not addressed in Revision 0.
[4]Decayed through 2006.

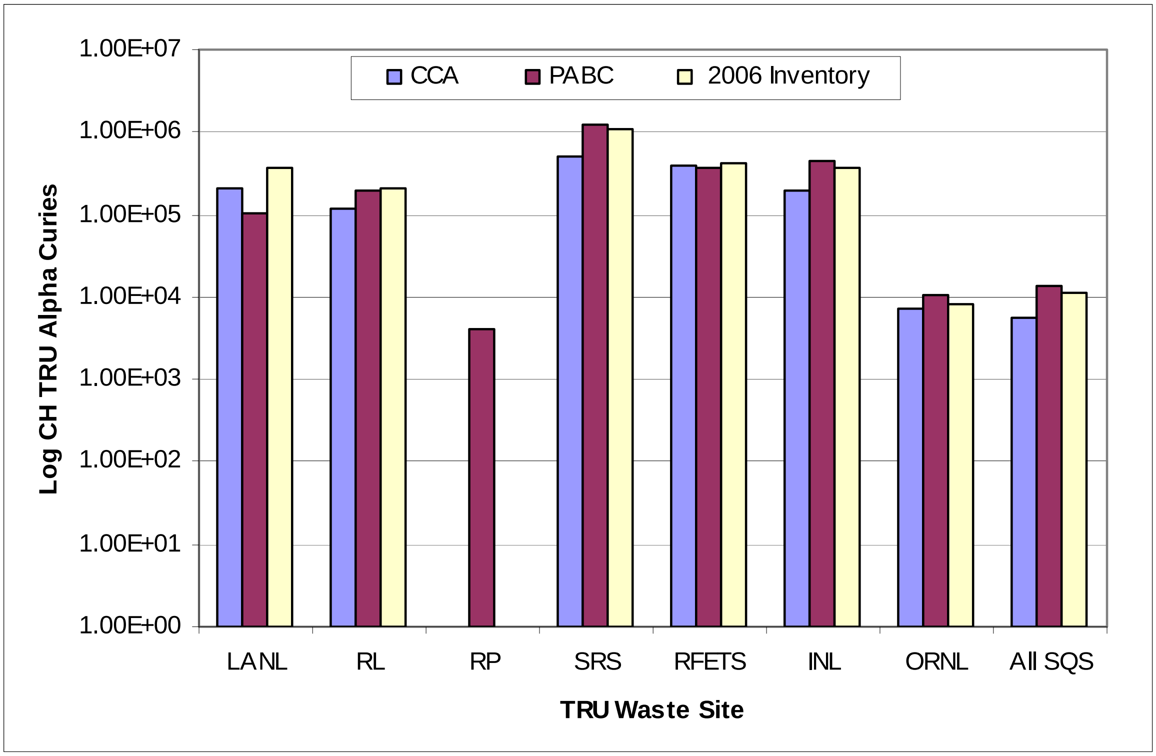

Figure D-12. Unscaled CH-TRU Alpha Radionuclide Curie Comparisons

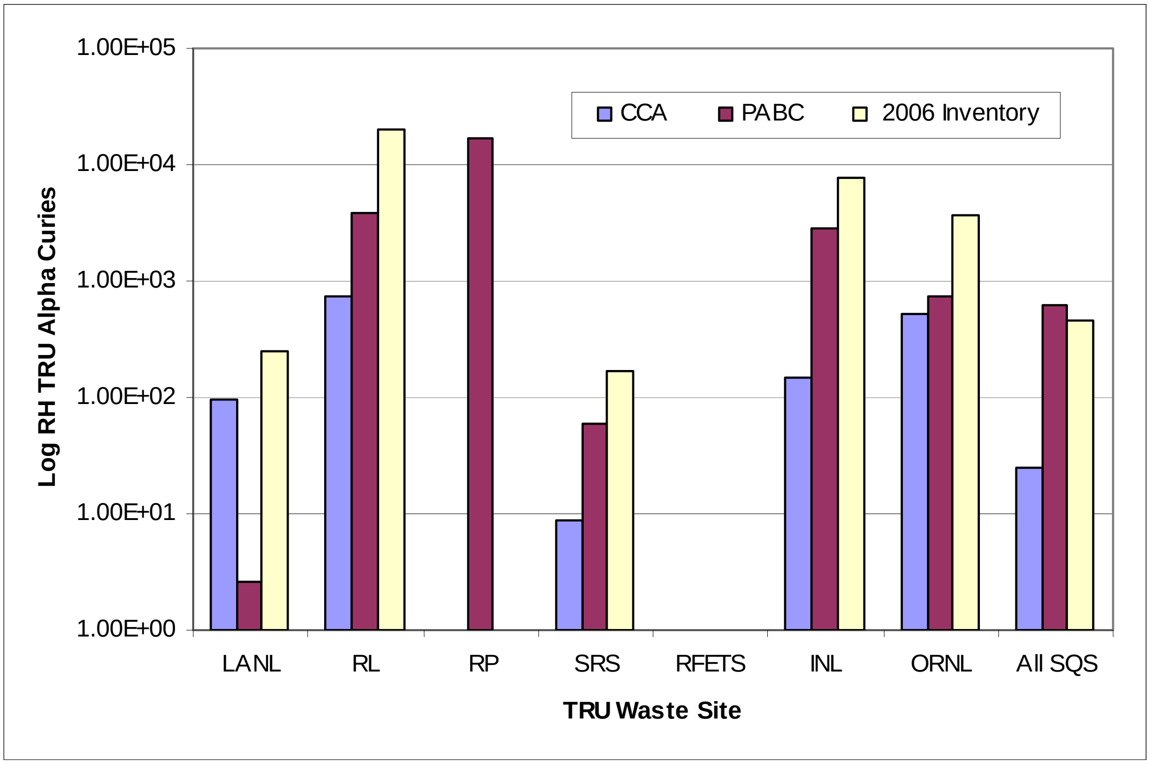

Figure D-13. Unscaled RH-TRU Alpha Radionuclide Curie Comparisons